



**UNIVERSITI PUTRA MALAYSIA**

**RATIONAL EXPECTATIONS AND SURVEY DATA**

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# **RATIONAL EXPECTATIONS AND SURVEY DATA**

**By**

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**Thesis submitted to the School of Graduate Studies, Universiti Putra Malaysia,  
in Fulfillment of the Requirement for the degrees of Master Science**

**August 2002**



Abstract of thesis presented to the Senate of Universiti Putra Malaysia in fulfillment of the requirement for the degree of Master of Science

## **RATIONAL EXPECTATIONS AND SURVEY DATA**

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**August 2002**

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How economic agents form their expectations of future economic events has been an importance issue in macroeconomics for many years. Indeed, business firm's expectations has played a central role in the business cycle theories of both Pigou (1927) and Keynes (1936). Acknowledging that the behavioral assumption of the rational expectation is important to modern economic theory and econometric modeling, this study is undertaken for the purpose of investigating whether the Malaysian *Business Expectation Survey For Limited Companies*, provides the basis for prediction which, satisfy the rational expectations hypothesis (REH) and property in the sense of Muth (1961).

The business survey-based expectations, drawn from *Business Expectations Survey of Limited Companies* (BESLC), conducted biannually by the Malaysia's Department of Statistic, offer a unique opportunity to accumulate empirical evidence on expectation formation and decision-making at micro level. Four criteria of 'rationality' is examined in the study namely, unbiasedness, serial correlation of forecasts error, weak-form efficiency and orthogonality.

Essentially, this study utilizes business survey data in a manner that is different from prior study by testing the rationality of firm's expectations at different level of aggregation. Accordingly, the sectoral subdivisions are as follows: the aggregated respondents of the BESLC survey data are group into three divisions of significant sectoral in Malaysia: that is, primary sector, industrials sector and service sector. At an even higher disaggregated level, the manufacturing sub-sector under the industrial sector, which can be further segmented into consumer goods industry, capital goods industry, as well as light and heavy intermediate goods industry.

Evidently, the significance of the use of disaggregated data is noted in this study. Apparently, REH are rejected comprehensively when directs test were performed on the sectoral segmentation level. At a higher disaggregated level, as the direct tests are applied to the data from most of the constituent industries of manufacturing sectors, these test provide at least some amount of direct evidence in favor of the hypothesis, which is often simply assume to be valid, that expectations are rational as defined by Muth (1961). Hence, this implies that the prior investigations of the rationality of survey expectational data have overlooked relevant data by disregarding the potential of aggregation bias encompassed by the aggregated survey data. Although the presence of the aggregation bias has not been formally tested, the results of this study here suggest that this potential bias may be of importance.

Abstrak tesis yang dikemukakan kepada Senat Universiti Putra Malaysia sebagai memenuhi keperluan untuk ijazah Master Sains

## **JANGKAAN RASIONAL DAN DATA TINJAUAN**

**Oleh**

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Perihal bagaimana agen ekonomi membuat jangkaan terhadap peristiwa ekonomi pada masa hadapan merupakan satu isu yang penting dalam makroekonomi untuk sekian lamanya. Sememangnya, jangkaan firma perniagaan telah memainkan peranan penting dalam teori kitaran perniagaan Pigou (1927) dan Keynes (1936). Menyedari tentang andaian perlakuan jangkaan rasional adalah penting kepada teori ekonomi moden dan model ekonometrik, tujuan kajian ini adalah untuk mengkaji sama ada *Tinjauan Jangkaan Perniagaan Syarikat Berhad Malaysia* (BSELC), memberi ramalan asas yang memenuhi hipotesis jangkaan rasional (REH) dan ciri-ciri dari segi pengertian Muth (1961).

Jangkaan berdasarkan tinjauan perniagaan ini, yang dijalani dua kali setiap tahun oleh Jabatan Statistik Malaysia, menawarkan peluang yang unik untuk mengumpul bukti empirikal atas pembentukan jangkaan dan pembuatan keputusan pada tahap mikro. Empat kriteria 'kerasionalan' diselidik dalam kajian ini, iaitu, ketidakbiasan, korelasi ralat jangkaan bersiri, kecekapan dan 'orthogonality'.

Pada dasarnya, berlainan dengan kajian yang sebelumnya, kajian ini menggunakan data tinjauan dengan menguji kerasionalan jangkaan firma pada tingkat agregat yang berlainan yang mana respon agregat dikumpulkan kepada tiga sektor utama di Malaysia, iaitu, sektor primer, sektor industri dan sektor perkhidmatan. Pada tingkat dis-agregat yang lebih tinggi, sub-sektor perkilangan dalam sektor industri, disegmenkan selanjutnya kepada industri barangan pengguna, industri barangan modal, industri barangan perantaraan ringan dan berat.

Buktinya, kepentingan penggunaan data dis-agregat dapat diperhatikan dalam kajian ini. Nampaknya, hipotesis jangkaan rasional ditolak secara komprehensif apabila ujian langsung dilakukan pada data peringkat segmentasi sektor. Pada tingkat dis-agregat yang lebih tinggi, dimana ujian langsung dilakukan dengan menggunakan data tinjauan daripada industri perkilangan, sebanyak-sedikit ia menunjukkan bukti langsung yang memihak kepada hipotesis yang selalunya diandaikan sah ini. Maka, ini bermakna kajian sebelum ini telah mengenepikan data yang relevan dan tidak peka terhadap potensi bias data tinjauan agregat. Walaupun kehadiran agregat bias tidak diuji secara formal, namun, keputusan kajian ini mencadangkan bahawa potensi bias ini mungkin wujud.

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I certify that an Examination Committee met on 27<sup>th</sup> August 2002 to conduct the final examination of Eng Yoke Kee on her Master of Science thesis entitled "Rational Expectations and Survey Data" in accordance with Universiti Pertanian Malaysia (Higher Degree) Act 1980 and Universiti Pertanian Malaysia (Higher Degree) regulation 1981. The Committee recommends that the candidate be awarded the relevant degree. Members of the Examination Committee are as follows:

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## DECLARATION

I hereby declare that the thesis is based on my original work except for quotations and citations which have been duly acknowledged. I also declare that it has not been previously or concurrently submitted for any other degree at UPM or other institutions.

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## LIST OF ABBREVIATIONS

ADF	Augmented Dickey-Fuller
AIC	Akaike Information Criteria
ARCH	Autoregressive Conditional Heteroskedasticity
BEA	Us Bureau Of Economic Analysis
BESLC	Business Expectations Survey Of Limited Companies
CBI	Confederation Of British Industry
CPI	Consumer Price Index
ECM	Error Correction Model
EEC	European Economic Communities Countries
EG	Engle-Granger
IRS	Institute For Social Research
JB	Jarque-Bera
KPSS	Kwiatkowski, Phillips, Schmidt And Shin
LM	Lagrange Multiplier
M1	Monetary Aggregate
MISE	Manufacturers' Inventory And Sales Expectation
MMS	Money Market Survey
NGDP	Nominal Gross Domestic Product
OLS	Ordinary Least Squares
REH	Rational Expectation Hypothesis
REH-MEJ	Rational Expectations-Market Efficiency Hypothesis
REH-NRH	Rational Expectation Hypothesis-Natural Rate Hypothesis
RCT	Restricted Cointegration Test
RESET	Regression Specification Error Test
RFR	Realized Forecast Regression
UBT	Unbiasedness Test
USDA	United State Department Of Agriculture

# CHAPTER 1

## INTRODUCTION

### 1.1 Introduction

How economic agents form their expectations of future economic events has been an important issue in macroeconomic studies for many years. In fact, the role of business firm expectations in the business cycle theories has been recognized by both Pigou (1927) and Keynes (1936). Furthermore, dealing with incomplete information as well as uncertainty, forming expectations about the future economic environment has been one of the crucial functions of business management and decision making process by business firms. For example, in discussing the determination of the level of employment, Keynes note that,

*Thus the behavior of each individual firm in deciding its daily output will be determined by its short-term expectations — expectations as to the cost of output on the various possible scales and expectations as to the sale-proceeds of this output...It is upon these various expectations that the amount of the employment which the firms offer will depend. The actually realized results of the production and sale of output will only be relevant to employment in so far as they cause a modification of subsequent expectations.*

(Keynes, 1936, p.47)

There is no doubt that Keynes has laid great emphasis upon the importance of expectations. However, despite the leading role of Keynes's work on expectations, Keynes did not really address the question of how expectations are form. Throughout the year, there has been a great deal of research in macroeconomic to

convert the Keynesian expectation-based into an operational theory with testable hypotheses. Amongst the various theories of expectations so far advanced, the hypothesis of rational expectations suggested by Muth (1961) has provided the most formidable challenge to economics and has been the spark for a considerable volume of empirical work for evaluating the property of expectations formation mechanism.

In fact, as Simon (1978, p.12) outlines, economics, whether normative or positive, it is not merely been the study of the allocation of scare resources, but it is the study of the *rational* allocation of scarce resources. More on this point, despite the facts that this new set of theoretical propositions, is one of the key assumption of the 'new classical macroeconomics' of Lucas (1972), Sargent (1973), Barro (1984) and among others, it has been loosely termed as *rational expectation macrotheory* in economics (Carter and Maddock, 1984).

## 1.2. Expectations

Expectations in economics are essentially forecasts of the future values of economic variables, which are relevant to current decision. In other words, expectations, then, are the decision-maker's forecasts or predictions regarding the uncertain economic variables, which are relevant to his or her decision.

### **1.3. Expectations in Macroeconomics**

A crucial challenge for economists is figuring out how people interpret the world and form expectations that will likely influence their economic activity. Inflation, asset prices, exchange rates, investment, and consumption are just some of the economic variables that are largely explained by expectations. As utility-maximizing agents form expectations in their decision-making process, if economic theory is to be able to explain the behavior of economic agents it must be capable of taking expectations formation fully into account. The manner in which economic deal with expectations formation in macroeconomic models and to derive the implications for policy purpose is of importance. Competing macroeconomic models can frequently be related within a general framework once their different expectations formation mechanisms are recognized. Models of a macroeconomic system may be internally inconsistent unless the prior question of expectation formation is address explicitly. In the existing literature, there have been many attempts to modelling the expectation formation – with a gradual evolution of the concepts of expectation from Keynes to recent Muth's (1961) rational expectations.

#### **1.3.1 Keynes (1936) and Exogenous Expectations**

Although the importance of expectations in economics has long been recognized, one of the first economists to formalize the role of expectations was John Maynard Keynes (1936). Keynes' analyses of the level of employment, demand for money,

the level of investment and the trade cycle all depend crucially on *animals spirits*<sup>1</sup>. In his argument, business investment depended crucially on the mood of investor. Business confidence or the mass psychology of groups of investors becomes a central focus of his analysis.

On one hand, the importance of expectations has been emphasis by Keynes, but on the other hand Keynes did not really address the question of how expectations are formed. In fact, there appears no objective way in which such a mode of expectations formation may be logically incorporated into formal model analysis. For him, Keynes believed that expectations, whilst importance, can be taken as exogenous and imposed upon the model instead of being endogenously determined by the workings of the model. By doing so, in terms of model analysis, it is possible to allow for an exogenously imposed change upon the state of business confidence.

Of course, Keynes's exogenous expectation is far from satisfactory solution. It is not easy to model the expectations based upon animal's spirits. What is needed in the macroeconomic expectations modelling is that expectations change endogenously as the model evolves. Such adjustment, however, is lacking in the Keynesian approach. Notwithstanding this, the work of Keynes has stimulated the attempts of modeling expectation formations.

---

<sup>1</sup> An expression that introduced by Keynes in the *General Theory* to refer to movements in investment that could not be explained by movements in current variables.

### 1.3.2 Metzler (1941) and Extrapolative Expectations

Since expectations variables are widely used in applied econometrics, and directly observed expectations or anticipations are relative rare during the early studies, implicit forecasting schemes are used extensively. The most commonly widespread approaches used in economics were the autoregressive models. Above all, the simplest form of autoregressive expectation formation is the extrapolative expectations formation. As a matter of fact, this is one of the earliest post-Keynesian attempts to model changing expectations. In introducing the idea of extrapolative expectations, Metzler (1941) reasoned that future expectations should be based not only on the past level of an economic variable, but also on its direction of change, denoted mathematically,

$$X_{t+1}^e = X_t + \alpha (X_t - X_{t-1})$$

Where  $\alpha$  = coefficient of expectation. If  $\alpha > 0$ , then, past trend are expected to be continue, whereas  $\alpha < 0$ , past trends are expected to reversed.

Clearly, past trends are undoubtedly importance in conditioning future forecasts and this is the essence of the approach. However, although the past trends are considered, past experience — and in particular past expectational errors — are not. As highlighted by Tobin (1972, p14) these '*are almost surely inaccurate gauges of expectations. Consumers, workers and businessmen...do read newspapers and they do know better than to base price expectations on simple extrapolation of price series alone*'. In what follows, this constitute to the development of adaptive

expectations approach that economic agents are assumed to adapt their expectations in the light of the extent to which previous expectations have been shown to be false.

### 1.3.3 Cagan (1956) and Adaptive Expectations

A special form of autoregressive expectation formation, attributed to Cagan (1956), has been used frequently in economics. In contrast with all other autoregressive models, the models explicitly take into consideration associative learning, which corrects future expectation on the basis of past forecasting errors. According to the theory, agents revise their expectations each period according to the degree of the error in their previous expectations — hence the name of adaptive expectations<sup>2</sup>.

Algebraically,

$$X_{t+1}^e = X_t^e + \alpha (X_t - X_t^e) \quad ; (0 \leq \alpha \leq 1)$$

That is to say, the variable expected next period is equal to the variable expected this period plus some fraction of the extent that current expectation was shown incorrect. Until the recent introduction of the idea of rational expectations, adaptive expectations were the most common formalization of expectations used in economics. Its popularity was due to its conceptual simplicity and the ease with which it could be implemented empirically (Shaw, 1989).

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<sup>2</sup> Also known as backward looking, error learning model or error correcting model.



### 1.3.4 Muth (1961) and Rational Expectations

Economist John Muth had this discrepancy between adaptive expectations and model results in mind when he used the term rational expectations in 1961. In his pioneer paper, he chooses to set the expectations values for variables needed as inputs to various equations so as to be equal to the final predictions eventually coming out of the model. Muth's REH basically equates two concepts, economic agents' subjective, psychological expectations of economic variables are postulated to be the mathematical conditional expectation of those variables. This means that, on average, the economic agents' subjective expectations are equal to the true values of the variable and this is what he mean by that the individuals' expectations are 'essentially the same as the predictions of the relevant economic theory' (Muth, 1961).

Virtually, the idea of Muth can be clarified by some notation as below (see Sheffrin, 1983).

$$\left. \begin{matrix} \text{subjective} \\ \text{expectation} \end{matrix} \right\} = {}_{t-1}X_t^e = E[X_t | I_{t-1}] = \left\{ \begin{matrix} \text{conditional} \\ \text{expectation} \end{matrix} \right.$$

Where  ${}_{t-1}X_t^e$  is the subjective, psychological expectation for variable  $X_t$ . As depicted, the essence of the rational expectations approach is that there is a connection between the belief of the individual economic agents and the realized stochastic behavior of the system.